

REMARKS

Favorable reconsideration of this application is respectfully requested.

Claims 29-33 and 35-40 are present in this application. Under 35 U.S.C. §103(a) claims 29-33, 36, 37 and 40 stand rejected over U.S. 4,789,648 (Chow et al.) in view of U.S. 5,612,254 (Mu et al.), U.S. 4,832,789 (Cochran et al.) and U.S. 5,478,780 (Koerner et al.), and claims 35, 38 and 39 stand rejected over Chow et al. in view of Mu et al., Cochran et al. and Koerner et al. in view of U.S. 5,272,117 (Roth et al.).

Claim 40 has been amended, for clarity only, to make a minor change to the last line to insert words inadvertently omitted in a previous amendment. No change in the scope of claim 40 has been made. As the change is only the correction of a formal matter, entry of the amendment is proper under §1.116, and is respectfully requested.

Before addressing the prior art rejections, the applicants would like to provide the following brief discussion to facilitate a better understanding of the invention and its advantages. In the present invention, as recited in claim 29, a groove is formed in a region of a third insulating film in which a wiring is to be formed. The groove has a bottom to which a second insulating film is exposed. A part of the portion of the second insulating film which is exposed to the groove and a part of the first insulating film under the portion of the second insulating film is removed using the same etching mask. The same etching mask covers the third insulating film and another part of the portion of the second insulating film which is exposed to the groove. A contact hole is thus formed reaching to the semiconductor substrate. The etching mask covers a part of the portion of the second insulating film which is exposed to the groove. Thus, only a part of the portion exposed to the groove of the second insulating film is removed. The another part of the portion exposed to the groove remains, as

it is covered by the etching mask during the removing step. The contact hole is thus smaller than the groove since the another part of the second insulating film is covered by the mask.

As recited in claim 40, the mask is formed on the third insulating film and the second portion of the second insulating film. The second portion of the insulating film remains after etching through the second insulating film to expose the first insulating film. The portion of the second insulating film etched is not as wide as the groove since a second portion of the second insulating film is covered by the mask. Thus, the width of the third portion removed from the first insulating film is smaller than the width of the groove.

Returning to the §103(a) rejection, the Office Action again correctly finds that there is no suggestion in Chow et al. of the removing step of claim 29 or the step of forming the groove in step 40. In particular, the Office Action correctly finds that there is no suggestion in Chow et al. of the removing step using the same etching mask covering the third insulating film and another part of the portion of the second insulating film which is exposed to the groove in claim 29 or forming the groove using the same mask where the mask is formed on a third insulating film and the second portion of the second insulating film as recited in claim 40.

The Office Action also finds Mu et al. to fail to teach the removing step of claim 29 or the step of forming the groove of claim 40, since this reference also fails to teach using the mask covering the third insulating film and another part of the portion of the second insulating film exposed to the groove (claim 29) or a process where a mask is formed on the third insulating film and the second portion of the second insulating film (claim 40).

The Office Action newly cites Cochran et al. and asserts this reference teaches forming an etching mask 35 over layer 27 and in the groove formed in layer 27, referring to column 2, line 64-column 3, line 45, and further asserts that it would have been obvious to

use such a mask in the combined teachings of Chow et al. and Mu et al. However, the mask 35 in Cochran et al. is different from the mask recited in claim 29 or claim 40, and further there is no suggestion to use the mask 35 in the combined teachings of Chow et al. and Mu et al.

As shown in Fig. 4 of Cochran et al., mask 35 is formed on layer 29 and in a shallower groove located in the center portion of the drawing. Claim 29 recites forming a groove in a third insulating film having a bottom to which the second insulating film is exposed, and removing a part of that portion of the second insulating film exposed to the groove using an etching mask covering the third insulating film and another part of the portion of the second insulating film which is exposed to the groove. The mask 35 of Cochran et al. does not cover insulating layer 27 and a part of the film 25 which is exposed to the groove. No portion of mask 35 is formed on any portion of layer 25 exposed in the groove on the right-hand side of Fig. 4 in Cochran et al. Thus, Cochran et al. clearly does not suggest the process of claim 29 having the removing step where the same etching mask is used covering the third insulating film and another part of the portion of the second insulating film which is exposed to the groove.

Also, it is pointed out that Cochran et al. describes forming contact holes with varying depths by using mask 35 and etch stop layer 29. The method of claim 29 forms a groove and a contact hole, the contact hole having a smaller width than the width of the groove since the mask covers the another part of the second insulation film. Cochran et al. and the present invention as recited in claim 29 are clearly different on this point. In claim 29 copper is buried in the groove and in the contact hole forming a copper wiring and a copper contact, respectively. The copper wiring and copper contact formed in claim 29 cannot be formed with the mask 35 of Cochran et al.

It is also clear that Cochran et al. does not suggest the process of claim 40 since the mask in claim 40 is formed on the third insulating film and on the second portion of the second insulating film, which remains after etching through the second insulating film. There is no second insulating film exposed in Cochran et al. on which a mask is formed. Accordingly, Cochran et al. does not disclose or suggest the method of claim 40.

There is also no suggestion that the process of Cochran et al. would be combined with the process of Chow et al. In Chow et al., windows 7 are formed in film 6 where it is desired to etch layer 5. Film 6 acts as a mask. The process of Cochran et al. forms the windows in layer 25 but does not rely on layer 25 as a mask. The processes are simply different and not combinable in the manner suggested in the Office Action.

The Koerner et al. reference is cited solely for the purpose of forming copper interconnects. There is no assertion that Koerner et al. has any teachings related to the removing step of claim 29 or the step of forming a groove in claim 40. Therefore, even if the teachings of Koerner et al. were combined with the teachings of Chow et al., Mu et al. and Cochran et al., the combination would still fail to disclose or suggest the methods recited in claims 29 and 40. Similarly, the Roth et al. reference is relied upon for teaching a Nb film and thus the combination of this teaching with that of Chow et al., Mu et al., Cochran et al. or Koerner et al. would also fail to disclose or suggest the method of claim 29 or the method of claim 40.

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It is therefore respectfully submitted that the present application is in condition for allowance and a favorable decision to that effect is respectfully requested.

Respectfully submitted,

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